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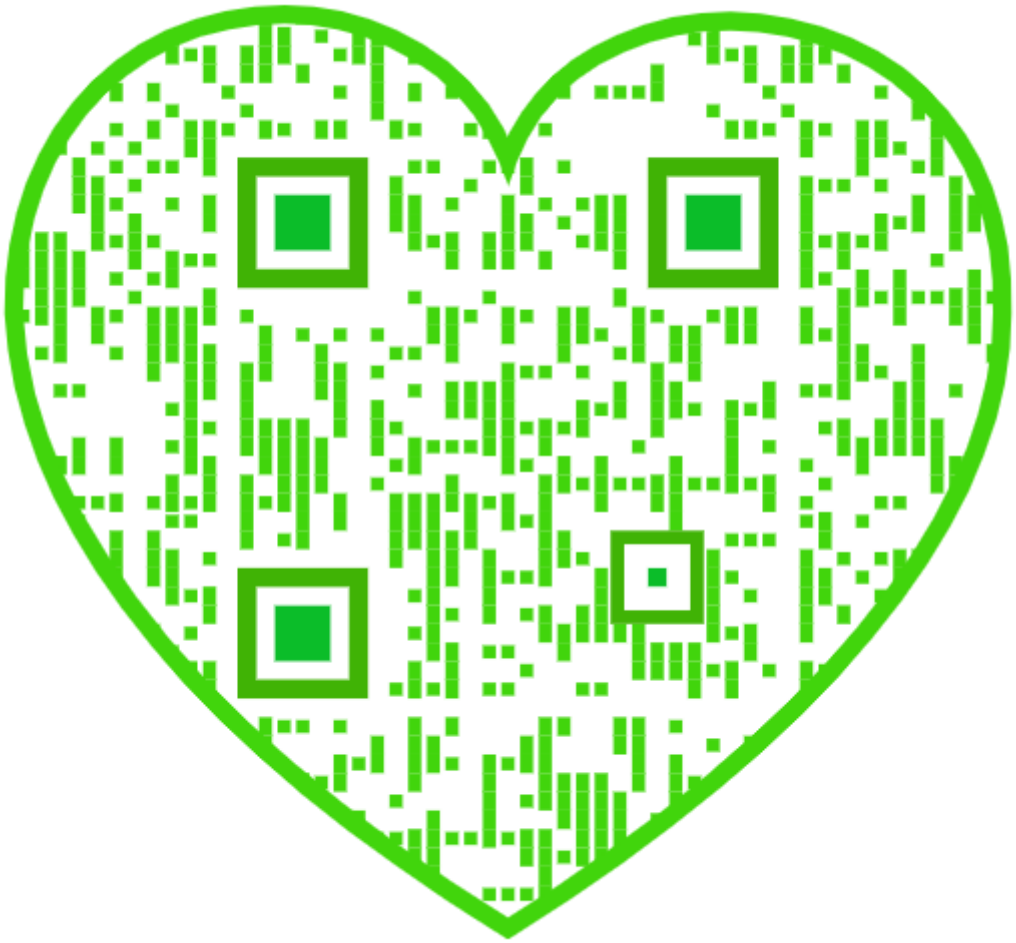
Its Cause, Symptoms and Treatment

BY

GEORGE T. HOWLAND, M. D.

Fairview Farm

Norwichtown, Connecticut



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Bovine Tuberculosis.

There is no one subject in all human and veterinary medicine that is so important to mankind as the disease of Tuberculosis, and no one subject in veterinary medicine that has caused so much discussion and difference of opinion as Bovine Tuberculosis. Various names have been given to this disease, as Tuberculosis, Phthisis Pulmonalis, Consumption, the Wasting Disease, the White Plague in the human, while in the bovine it is spoken of as Grape Disease, Pearl Disease, Wasters, Piners, Snorters, according as the lungs, bowels, or glands of the throat were attacked. Many cases of so-called Wens or Clivers and swellings in the udder are undoubtedly of a tuberculosis nature.

Hardly any warm blooded animals are exempt from it. It is caused by a germ, the Bacillus Tuberculosis, discovered by Dr. Robert Koch (Berlin, Germany,) in 1883. The germ having once entered the system, and all things being equal, that is, there is a certain spot in the body that is "sick," below "par," which may form the seat of the disease, and from which spot the germs may be manufactured, so to speak, and go forth to attack and locate in other parts of the body.

This germ can be and is transmitted from human beings to animals and vice versa.

These germs are not visible to the naked eye, and can only be seen with the aid of a microscope. They appear in the human as little rods, very fine, and often bent or curved, and have the average length of nearly one-half the diameter of a human red blood corpuscle, or 1-7000 of an inch in diameter. When stained they often present a beaded appearance, which some have attributed to the presence of spores. The spores of germs are the immature forms, or the parent cells, from which germs are developed.

With the basic aniline dyes the germ stains slowly, except at a temperature of 98° to 100° F., but retains the dye after

treatment with acids, a characteristic which separates it from all other known forms of germs, with the exception of the germs of Leprosy.

Dr. Koch found that these germs would only grow under certain definite conditions. As soon as he found in the sputum any tubercles (the tubercle is the diseased spot caused by the presence of the tubercular germ,) it became necessary to ascertain whether they were the actual cause of the disease or only happened to grow after the disease had become established.

To determine this point some of these germs were grown in glass tubes containing a mixture of gelatine and broth, and were kept in them at a regular temperature of about 99° F., for some weeks. On this nutrient medium the germs grew, and after a time the appearance they presented was that of a gray membrane extending over the surface. Some of the germs were then taken from these glass tubes and planted in other glass tubes and grown under similar conditions.

This was repeated a number of times, so that there was no possibility of any other germs being present in the last tubes.

A number of germs were taken from one of the last tubes, and introduced into the body of a healthy animal; in some cases they were injected under the skin; in other cases they were injected into the veins or abdomen; and in others, again, the germs were mixed with the food given to the animals.

The result was that in the course of a short period, a month or two, the animals were killed and a post mortem examination made, revealing the presence of the disease in various parts of the body, containing the same sort of germs as inoculated.

These experiments established the fact that these germs are the cause of Tuberculosis, both in the human and bovine families.

The following are among the chief accessory causes:

HEREDITY.

Tuberculosis may be inherited, but in what way and how often are unsettled problems. The rarity with which it occurs may be gathered from the fact that out of 15,500 calves killed at the Berlin slaughter house there were only four calves that had Tuberculosis.

This would seem to prove that neither the sire or dam, if

affected with Tuberculosis, has the power of transmitting direct the disease to their offspring. And studies and experiments along these lines seem to prove this to be so, but there is no question, to our way of thinking, that where the parents are tuberculous, either one or both, if they do not transmit the germ direct to the foetus, they do transmit a constitutional tendency especially favorable to the growth of this germ when introduced into the body.

Therefore, under these conditions, we would consider it wise not to breed animals that are known to have Tuberculosis, thereby stamping out the disease all the more rapidly.

CLIMATIC INFLUENCE.

We do not believe that any climate is exempt from the disease, but there is no question but what high, dry climate, with plenty of sunshine has a deterrent effect upon the growth of the germ, and therefore, to a certain extent, a controlling influence for good is exerted.

GEOLOGICAL CONDITIONS.

It has been claimed that Tuberculosis is due to a large extent to the soil. That this may hold a certain amount of truth we do not wish to deny, but the soil must have been inoculated with the germ of Tuberculosis first, and we believe that if the soil is not inoculated, the chance of contracting the disease from the soil is slight.

INFLUENCE OF FOOD.

Some observers claim that certain foods render the system particularly favorable for the disease of Tuberculosis. The only way we believe this can occur is to introduce the germ in the food.

BARNS OR HOUSING.

Statistics show that animals kept in barns ill ventilated and devoid of the direct rays of the sun have more Tuberculosis than animals living in the open air.

The unhygienic conditions that are always found in badly constructed, ill lighted, (by sunlight,) ill aired barns are only a means by which the germs are kept alive, and thus become a factor in producing Tuberculosis.

All dairymen are aware that their animals do better, eat better, digest their food better, and give more milk in good, clean, bright surroundings (barns) than can be secured under reverse conditions. Pure air is necessary for the good health of every animal, and especially necessary for the working animals.

To command this feature, a certain amount of air space must be allotted to each animal. This amount of "air space" varies to a certain extent with regard to the size of the animal. Figures have been submitted from time to time as to the amount of air space necessary for cow barns when situated in country or cities, and in accord with the size of the animal.

(It is no place to keep cows in the confines of a city. It should be proscribed by law.)

One should not build a barn for the housing of cows unless he has air space enough to allot to each animal. The rule has been that the minimum air space allowed for each animal should correspond to one cubic foot for each pound weight of the animal's body, and we think it would enhance the good health of the animals if they were given two cubic feet of air space, instead of but one cubic foot.

We know of barns where large herds are kept, where the latter space has been given to each animal, and with plenty of sunlight admitted. This herd is never sent to pasture. It is turned out once a day, in suitable weather, into a paddock adjoining the cow barn, for a few hours only.

Every precaution known to science is observed in keeping all disease out of this herd, especially Tuberculosis. Whenever any new stock are added they are not placed with the herd until after they have been subjected to a thorough examination and tested out with the "Tuberculine Test."

They are studied, the milk is examined by the microscope as well as by the Babcock Test. Cultures are made of their dung for the germs of Tuberculosis. Cultures are also taken from the mouth, and blood counts are made.

They are detained in what is called the "observation barn" from four to six weeks, regardless of any certificate of health that accompanies the animals, before they are allowed to be placed with the herd.

The expense attending all this is of some amount, but nowhere near what one would imagine, and as the proprietor said, "I was cleaned out once by Tuberculosis, and I am taking no chances again." They were all thoroughbred cattle.

How soon Bovine Tuberculosis would be wiped out if all would follow these methods.

Where cattle with Tuberculosis have been confined in stables, and where the stalls are made of wood and no disinfectant used, the surrounding wood work is more or less impregnated with the germs, and we have made cultures from such places and always found the germs.

One will observe that in discussing the causes of Tuberculosis, as given above, there has run through them all but one cause, that of

CONTAGION,

And that has been through the admittance of the Tuberculous germ into the body where, under favorable conditions, it has inoculated the entire system.

With the knowledge that we have today as to the causes of Tuberculosis and its effects, as compared with what we knew thirty years or twenty years ago, it will be admitted that we have made great advancement toward the stamping out of this disease, but we are not there yet, and it behooves all to do all they can to add their "mite" in helping and aiding all they know how to wipe this dread disease from off the face of the earth.

Statistics show that in the past forty years Tuberculosis of the Lungs in man has diminished by about 38%, but that during the same period Tuberculosis of the Bowels has only diminished by less than 5%. Dr. Wm. H. Parks of the New York City Health Department reports that 40% of bottle-fed infants die from Tuberculosis.

The high percentage of Tuberculosis of the Bowels is undoubtedly caused by admittance of the germ from tuberculous milk in the larger per cent of these cases. For milk nowadays is largely used as a food for children, and it is from this source that the mortality is so large.

SYMPTOMS.

It is suprising how few physical signs are present in Tuberculosis of cattle. This undoubtedly is due to the fact that the animal has strong resisting powers, and does not give signs of having the disease until the invasion of the system is complete.

If the lungs are affected, then there will be a cough, rapid breathing, pulse rapid, rise in temperature, nose dry, "off their feed." Auscultation will generally reveal the condition of the lungs.

When the disease is located in the digestive or alimentary tract, there is more or less disturbance of the digestion, and generally there is a persistant diarrhoea.

When the udder becomes the seat of the disease, there will be found more or less inflammation, with hardness or tumor, and often blood is found in the milk. This hardness may grow until the quarter is useless and the entire gland becomes involved in this manner and cannot secrete milk.

How can we tell positively that the animal has Tuberculosis, or, in other words, diagnose the case?

There are two methods that can be employed, namely; by the microscope and by the injection of tuberculine.

By the use of the microscope in the examination of the cultivations of the germs which have been cultivated upon sterilized mediums, which have been inoculated by specimens from the suspected animal, if possible in collecting some of the discharge coughed up from the lungs or air passages, or taken from the food or from the dung, if the disease is situated in the bowels, from the milk, if the udder be infected.

These germs, if properly stained, will be shown under the microscope. They are almost always found, if present, at an early stage of the disease, in the dung, as cows generally swallow what they dislodge from the air passages and lungs, though in some cases these germs have been found on the food by some observers.

THE TUBERCULIN TEST.

Tuberculin was discovered by Dr. Robert Koch of Berlin, in 1890, and was first used experimentally in treating Tuberculosis in man. In these cases it was found that its injection was followed by a rise of the body temperature, which led

veterinarians to apply tuberculin to suspected animals to see if a similar reaction resulted. Numerous experiments showed this to be the case, and since 1891 the use of tuberculin as a diagnostic agent for Tuberculosis of cattle has been almost universally adopted in all parts of the civilized world. No one thinks of accepting tuberculin as an absolutely infallible remedy, but it is more dependable than any other method that has been used up to the present time.

Tuberculin is the sterilized and filtered glycerine extract of cultures of tubercle germs. It contains the cooked products of the growth of these germs, but not the germs themselves. Therefore, when the tuberculin is injected under the skin of an animal, it is absolutely unable to produce Tuberculosis, cause abortion, or effect the milk, or otherwise injure the animal. In fact, if the injected animal is of normal health, there is no more effect upon the system than would be observed from the injection of sterilized water. If, on the other hand, the animal is tuberculous, a decided rise of temperature is observed after the use of the tuberculin.

The method of applying the tuberculin is as follows, or that is the method that we use. Twenty-four hours before we inject the animal we take the temperature every two hours, so as to get the normal readings of temperature. We select for the point of injection a spot just behind the right foreshoulder. We clip the hairs with a horse clipper about the size of a silver dollar, wash thoroughly with soap and hot water, and disinfect it with a 5% Sulpho Napthol solution. The hands being disinfected as well as the sponge, pick up the skin between fore finger and thumb, and inject the tuberculin. The time of injection that we practice is at 10 a. m., and we always use the freshly prepared product, although it is stated that tuberculin wil keep indefinitely if put up in dark colored bottles and stood in a dark place. For our part, we prefer to take no chances, and thus get the best possible results.

We commence to take temperatures after the injection of the tuberculin, at 5 a. m., the next morning, and continue at intervals of every two hours until 12 midnight, which covers a time of nineteen hours. Some of our knowing friends say that it is not necessary, and is too much work, but it is much harder to lose a good herd than it is to do this work.

We have found that the normal temperature varies in healthy cows from 100° to 101.5° F. The average is about 100.5° F. Any cow whose temperature is elevated by the injection from 1½° to 2° F., is immediately removed from the herd and placed in the isolation barn, and is retested with tuberculin at the end of thirty days. In the interval a specimen is taken from her dung and cultivated on egg media tubes, and examined for the tuberculosis germ. If the animal reacts and the germs are found, she is killed.

There are two other methods which have been proposed to find out if a cow has Tuberculosis, with the technique of which we are not familiar. One is the method of von Piquet, termed the "Cuti" reaction, in which the skin is scarified and the tuberculin applied. The other is the method of the "Wolff-Eisner and Calmette," termed the "Ophthalmo" reaction, in which the tuberculin is applied to the eye.

Perhaps these methods may be of use, especially where the ignorance of the owner of the herd objects to having his cows tested by injections of tuberculin. Then, in such cases, any method that will prove the presence or non-presence of the disease should be used.

THE VALUE OF THE TUBERCULIN TEST.

By the use of tuberculin an accurate diagnosis can be made in over 97 per cent. of the animals tested.

The Bureau of Animal Industry, of the United States Agricultural Department, reports that in fifteen years, from 1893 to to 1908, experiments by federal, state, and other officers with tuberculin prepared by the Bureau of Animal Industry show that out of 24,784 reacting cattle slaughtered, the disease of Tuberculosis was found in 24,387, a percentage of 98.39.

There are two classes of cattle where an error may be made in diagnosis.

The first class contains those that are tuberculous, but which do not react either because of the slight effect of the usually prescribed dose of tuberculin, or an advanced case of the disease with so much of the poison of Tuberculosis in her system, or on account of a previous test with tuberculin having been made within the last four or six weeks.

The second class includes those that are not tuberculous but which show an elevation of temperature as a result of:

1st. Cow being with calf and within a month of calving.

2nd. Cow being in heat.

3rd. Such diseases as Imflammation of the Lungs, Intestines, Womb, Udder, Abortion, Retention of Afterbirth, Indigestion.

4th. Improper stabling, unhygienic surroundings.

5th. Any change in the method of feeding, watering, or stabling of the animal during the test.

Still, in spite of all these errors, the results of thousands of tests show that in less than 3 per cent. of the cases tested do these failures actually occur.

In the first class of cases, the error of diagnosis may be reduced to a minimum by careful examination; and if the animal has been subjected to a previous test by tuberculin within the past four or six weeks, then the amount of the tuberculin injected should be increased to twice or three times the standard amount, and the temperature reading noted every ½ to 1 hour after injection, and continued for 19 or 20 hours.

In the second class of cases, error can be avoided by throwing out the conditions named above. Then in reading "after temperatures," it is advisable not to recognize as a reaction an elevation of temperature less than 1½° or 2° F., or one which at the same time does not go above 103.8° F., and the temperature curve must have the characteristic curve. A fresh preparation of tuberculin must be used and an accurate, self-registering thermometer, and the thermometer must be retained in the rectum from two to four minutes. A good aseptic syringe, with a strong, sharp needle, that will hold a sufficient amount of the tuberculin must be used. Then, when the veterinary makes the post mortem examination, have him especially examine the lymph glands.

If these points are carefully carried out, errors will become less and less in establishing the presence of Bovine tuberculosis.

Mohler, in the 24th Annual Report of the Bureau of Animal Industry, says: "That the low percentages of failures being the case, cattle owners should welcome the tuberculin test, not

only for their own interest, but for the welfare of the public as well. Where this method of diagnosing the disease has been adopted tuberculosis is gradually being eradicated, while it is spreading rapidly and becoming widely disseminated in those districts where the tuberculin test has not been employed. Without its use the disease cannot be controlled, and the cattle owner is confronted by serious and continuous losses; with its use the disease can be eradicated from the herd, a clean herd established, and the danger of its spreading to men removed. Tuberculin, may, therefore be considered a most beneficial discovery for the stock raiser. Strange to say, many of these men have been incredulous, antagonistic, or prejudiced against the tuberculin test by misinterpreting published statements, by incorrect, unsubstantiated, or exaggerated reports, and by alleged injurious effects to healthy cattle."

Law states, in the Text Book of Veterinary Medicine, vol. 4, pp. 458, 465: "Many stock owners still entertain an ignorant and unwarranted dread of the tuberculin test. It is true that when recklessly used by ignorant and careless people it may be made a root of evil, yet as employed by the intelligent and careful expert it is not only safe, but it is the only known means of ascertaining approximately the actual number affected in a given herd. In most infected herds, living under what are in other respects good hygienic conditions, two-thirds or three-fourths are not to be detected without its aid, so that in clearing a herd from tuberculosis, and placing both herd and products above suspicion, the test becomes essential. In skilled hands the tuberculin test will show at least nine-tenths of all cases of tuberculosis when other methods of diagnosis will not detect one-tenth."

Nocard and Leclainche, in Les Maladies Microbrennes des Animaux, vol. 2, p. 85, say that: "Direct experiments and observations collected by thousands show that the tuberculin injections have no unfavorable effects. With healthy animals the system is indifferent to the inoculation; with tuberculous animals it causes only slight changes, which are not at all serious."

Salmon, in the Year Book of the United States Department of Agriculture, 1901, p. 592, has this to say in regard to the tuberculin test:

"1st. That the tuberculin test is a wonderfully accurate method of determining whether an animal is affected with tuberculosis.

"2nd. That by the use of tuberculin the animals diseased with Tuberculosis may be detected and removed from the herds, thereby eradicating the disease.

"3rd. That tuberculin has no injurious effect upon healthy cattle.

"4th. That the comparatively small number of cattle which have aborted, suffered in health, or fallen off in conditions after the tuberculin test were either diseased before the test was made, or were effected by some cause other than the tuberculin.

Dr. A. D. Melvil, Chief of the Bureau of Animal Industry of the United States Department of Agriculture, in the 24th Annual Report, page 211, says, on the Reliability of the Tuberculin Test:

"There has been considerable incredulity with reference to the tuberculin test, particularly among those opposed to the movement to stamp out the disease, but the statements of such persons should not be given serious consideration, except as they may be the means of prejudicing the uninformed against the tests. There is no more reliable diagnostic agent than properly prepared tuberculin in the hands of the careful observer. The reports received by the Bureau of Animal Industry from the state officials from all parts of the United States of tests made by competent veterinarians absolutely confirm this statement.....It is understood, of course, that tuberculin should be administered by a reliable veterinarian, and that in addition to the test a physical examination should be made of the cattle. That impotent tuberculin has been on the market is a fact which has been demonstrated by the Bureau, and at its request Congress gave to it authority to make tests of tuberculin, vaccines, and similar products found on the market, and to publish results. Such tests are now being made, and if any inferior agents are found public notice of the fact will be given. The use of worthless tuberculin may to some degree have been the means of prejudicing some veterinary practitioners, as well as other persons, against the use of any tuberculin."

With such an array of expert testimony in favor of the use of tuberculin in diagnosing the disease of Tuberculosis in cattle, it seems hardly possible that any objection could be raised against the use of the tuberculin test. It certainly can only be justified on the part of ignorance of the most depraved kind.

TREATMENT OF BOVINE TUBERCULOSIS.

Here we are at fault, more so than we are with the human family, for there are cases on record that where the disease is taken in time it can be arrested, and to all intents and purposes cured, in the human.

It is almost a hopeless task to cure the disease in the bovine, when once established. The simplest and most expensive is to destroy the animals thus afflicted.

When animals are destroyed for this disease the best way to dispose of the carcasses is by burning them up. If they are disposed of in the usual way, by burial in the ground, then such precautions should be taken that no possible infection could come from the disintegration, as it is claimed that earth worms can carry the spores of tuberculous germs, and deposit them on the surface. A pit not less than eight to ten feet deep should be dug, and plenty of "quicklime" thrown over the carcass. It is also wise to select some remote spot for burial, which cattle cannot get at. Some go so far as to fence in such burial spots, and treat the ground with a strong solution of Bi-Chloride, at intervals, for four or five months.

It is stated that 25 per cent. of all stabled cows have tuberculosis, and, such being the case, what treatment known today will effect a cure?

There have, however, been some very important steps made in the direction of eradicating this disease from the bovine race, which, although in the initial stage, hold some reasonable consideration of ultimate success.

Tuberculosis can be prevented. To accomplish this it is necessary to keep tuberculous animals from entering the healthy herds. If they are admitted, and later the fact is discovered, it is necessary to remove them and to thoroughly disinfect the stable. Of the methods for the control of Tuberculosis in cattle, the one introduced by Prof. Bang of Copenhagen Denmark, and generally known as the "Bang method," has

given a reasonable amount of success. It consists in slaughter of the advanced cases and the isolation of the reacting animals which show no evidence of the disease, and keeping them for breeding purposes. The calves are separated from their dams immediately after birth, and fed on the milk of healthy cows or the sterilized milk of the reacting ones. Of course, one readily sees that this is not the "perfect way," for there is the element of danger, infection that must exist from all reacting animals tested with tuberculin.

The method of Prof. Ostertag of Berlin, Germany, a modification of Bang's, demands a clinical examination of the herd and the elimination of animals with open Tuberculosis, since only these excrete the tubercle bacilli, and hence endanger the healthy animals. In a certain sense, Ostertag's method presupposes that a clinical examination will discover the really dangerous animals to such a degree that the results will be an efficient way to keep down the tuberculous dissemination. Also he demands a bacterial examination of the milk of a suspected single animal as well as the milk of the entire herd, and also the raising of calves on sterilized milk. Here again is the element of danger, from infecting the young stock, but no doubt it has a reasonable amount of worth, if due care is exercised.

In 1901, Prof. Emil von Behring of Marburg, Germany, made known his Bovovaccine, for immunizing calves against Tuberculosis. He has already to his credit the discovery of the antitoxines of diphtheria and tetanus (lockjaw,) the value of which every practicing physician knows.

Bovovaccine consists of attenuated human tubercle bacilli, in sterilized normal salt solution, retains its vitality from four to five weeks, and is harmless when introduced into cattle.

Only healthy calves are to be treated; those out of condition should not be treated until they show good form. No cows in milk are to be bovovaccinated.

The age for this treatment is between two and twelve weeks, though animals over three months and up to one year of age. that have passed a satisfactory tuberculin test, may be treated, Three or four days should elapse between the tuberculin test and the vaccination with bovovaccine.

It is best to give a second treatment of the bovovaccine

about twelve months after the first, as this strengthens immunity and extends the period of duration. Calves thus treated have not reacted to the tuberculin test from five to six years afterwards.

This method of immunizing cattle has only been in vogue in this country for six years, and in Europe for a little over nine years, yet in both places cattle thus treated have not shown any symptoms of Tuberculosis when slaughtered.

All calves and cows that are vaccinated should be kept away from tubercular cattle until four months have elapsed, as at the end of this time immunity has usually been established.

Calves should be fed on Formaldehyde milk. This is made by adding abont fifteen drops of Formaldehyde to five teaspoonfuls of water or milk; pour into a pail which will hold ten quarts, and milk directly into this pail.

(This will also be found one of the best methods of treating scours in calves, and if along with the scours you have an unhealed navel the external application of a solution of 1-2500 of Formaldehyde to the navel will hasten the cure. If this treatment is employed, be sure that you use Formaldehyde, and not Formalin.)

The method of using Bovovaccine in animals is by injecting five immune units into the upper third of the cervical portion of the left jugular vein. The site of the operation is to be made as clean as possible, and washed with any good disinfectant agent. The syringe is to be sterilized, as well as the hands of the operator, and the wound made by the hypodermic needle to be washed with the antiseptic fluid after the withdrawal of the needle, using due care that all air is driven out of the syringe before introducing the vaccine into the vein. The vaccine fluid should be warmed to blood heat before using.

This vaccine is put up in sterilized glass tubes, a sufficient amount for one dose, and is dispensed by C. Bischoff & Co. of New York, and by communicating with this company we have no doubt that they will supply you with all the literature relating to this most important subject, for we believe that it is important, and that Dr. von Behring has established a means of eradicating Bovine Tuberculosis, and made a great step

ahead in eventually effecting a cure for those of the human race who are afflicted with Tuberculosis.

We also believe that the time is not far distant when bovovaccine will be subcutaneously injected into cattle, and thus do away with the more delicate introvenous operation. Experiments along the line of subcutaneous injection do not seem to be much in vogue at present, although there are a few experiments under observation, and in proper time they will be reported.

There is no doubt that a great interest has been awakened amongst breeders of cattle in the countries of the world by this method of treatment, as is shown by the articles that are printed in the daily and medical press of this and foreign countries, relating to this subject.

And we deem it of so much value that we are adding some of the more important articles and extracts, for the benefit of those who are not fully informed upon this matter, and who may wish to derive further explanation and knowledge, viz.:

Extract from the 51st Annual Report of the Trustees of the Northampton Insane Hospital, Northampton, Mass., for year ending Nov. 30th, 1906.

"In this connection I would say that, by the recommendation of the Cattle Bureau, we have been trying the inoculation of our calves with Bovovaccine, according to the so-called von Behring methods.....We have thus far vaccinated eleven calves. It is too early to make any report of the success of the method. All we can say is that no injurious effects whatever have been noted in any way of the calves so treated."

Extract from 52nd Annual Report of the same institution, Nov. 30, 1907.

"Last year's examination of our herd of cows showed the presence of tuberculosis to a considerable degree. All infected animals were separated from the sound ones. Many of the former showed no physical signs of the disease, and, when slaughtered, were found to have but a few small glands infected. Twenty-seven new cows were bought, after they had been tested and had not reacted. Yet, when the annual test of the herd was made this fall, several of the new ones and one of the old

herd reacted. That only one of the old herd reacted is encouraging, as it seems to show that the old herd is practically immune. We have inoculated 22 calves, and at the time of the test but one of these reacted, and the reaction in this case was doubtful. Consequently we feel that we have a nucleus for a herd that will be free from tuberculosis."

Extract from Lecture delivered by Dr. Klimmer before the Society for Physiology and Medical Science, at Dresden, Germany. (Münchener med. Wochenschrift, 1907, No. 31.)

" . . . . . In the course of the last three years, about 400 calves were immunized without ill effects to the animals. Not taking into account the hypersusceptibility to tuberculin shown by subcutaneously vaccinated animals for the period of one year after vaccination, not one of the animals treated according to the von Behring method has reacted, while 33 to 40 per cent. of the control animals have become tuberculous every year. Since their immunization, ten of the calves were slaughtered because of other diseases; they were found to be free from tuberculosis."

From the St. Albans Daily Messenger, July 14, 1908.

"H. H. Hill, proprietor of the Frederickhurst Farms, Swanton, has recently adopted the von Behring method, having had his young stock treated. This he will continue to do until he has built up an entirely immune herd, and all young stock at the farm will be subjected to the treatment. By this means, stock from his farm cannot carry any infection, nor can they become infected if introduced into a diseased herd."

From the Vermont Standard, March 26, 1908.

"Capt. Elton A. Smith, owner of the Cloudland Farms, who has one of the finest as well as one of the largest Jersey herds in the state of Vermont, has recently immunized seventy-five calves, and intends to continue as fast as the calves are of proper age to immunize."

J. H. Mead & Son, of the Marble Valley Stock Farm, Wes Rutland, Vermont, in a letter dated March 3, 1910, says:

"About a year and a half ago we had seven heifer calves treated with Bovovaccine. They were tuberculin tested this winter, and the result was very gratifying to us, as there was

not the slightest sign of a reaction among them. We have had 10 more treated this winter .... Would also say that we believe it is such a good thing, that no dairyman should be negligent enough not to use it. The calves all keep growing steadily, and we never had one miss a feed, or show any signs of being sick after receiving the treatment."

The Cattle Commissioner of the state of Maine has this to say, in a letter dated January 8, 1910:

"During the past four years our experience with Bovovaccine has been considerable, and I wish to assure you that the results have been exceedingly satisfactory. The work of immunization has been carried on in some of our worst infected herds, and I feel that it has been given a severe test. The results have been such that it seemed a valuable adjunct in our work of eradicating tuberculosis; consequently, at the last session of the Legislature a law was passed, providing Bovovaccine free of charge to the breeders of this state. Many breeders are availing themselves of this opportunity to build up immune herds, and I trust the number will increase."

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